Serial No. 09/535,629

AMENDMENTS TO THE CLAIMS:

Claims 1-44 (canceled)

45. (Currently amended) An optoelectronic device assembly comprising:

a substrate; and

~~an~~ a surface normal optoelectronic device on said substrate;

said optoelectronic device comprising a plurality of layers,

said plurality of layers including an optically transparent, encapsulation medium matching layer ~~overlying said optoelectronic device~~, said medium matching layer having an index of refraction n1 substantially equal to an index of refraction n2 of an encapsulation medium which is to encapsulate said optoelectronic device,

said medium matching layer having a predetermined thickness configured to adjust an optical characteristic of said optoelectronic device so as to make pre-encapsulation, on-wafer, test characteristics of said optoelectronic device substantially similar to post encapsulation functional characteristics.

C1

46. (Previously Added) The optoelectronic device assembly of claim 45 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

47. (Previously Added) The optoelectronic device assembly of claim 45 wherein said optoelectronic device comprises a VCSEL.

48. (Currently amended) An encapsulated optoelectronic device assembly comprising:

a substrate;

~~an~~ surface normal optoelectronic device on said substrate

said optoelectronic device comprising a plurality of layers; and

an optically transmissive ~~housing~~ encapsulation medium substantially encapsulating said optoelectronic device wherein said ~~housing~~ encapsulation medium has an index of refraction n1,

said plurality of layers of said optoelectronic device including ~~further comprising~~ an optically transparent, encapsulation medium matching layer ~~overlying said optoelectronic device~~, said medium matching layer having an index of refraction ~~n1~~ n2 substantially equal to said index of refraction ~~n2~~ n1 of said ~~housing~~ encapsulation medium,

said medium matching layer having a predetermined thickness configured to adjust an optical characteristic of said optoelectronic device so as to make pre-encapsulation, on-wafer, test characteristics of said optoelectronic device substantially similar to post encapsulation functional characteristics.

49. (Previously Added) The optoelectronic device assembly of claim 48 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

50. (Previously Added) The optoelectronic device assembly of claim 48 wherein said optoelectronic device comprises a VCSEL.

C1. contd

51. (Currently Amended) A VCSEL structure comprising:

a substrate;

a first mirror overlying said substrate;

an active optical region overlying said first mirror;

a second mirror overlying said active optical region; and

an optically transparent, encapsulation medium matching layer deposited onto said VCSEL structure and overlying said second mirror, said medium matching layer having an index of refraction n1 substantially equal to an index of refraction n2 of an encapsulation medium which is to encapsulate said VCSEL structure,

said medium matching layer having a predetermined thickness configured to adjust a reflectivity of said second mirror so as to make pre-encapsulation, on-wafer, test characteristics of said VCSEL structure substantially similar to post encapsulation functional characteristics.

52. (Previously Added) The VCSEL structure of claim 51 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

53. (Previously Added) The VCSEL structure of claim 51 further comprising an optically transparent tuning layer lying between said second mirror and said medium matching layer, said tuning layer being configured to predictably change a top facet reflectivity of said second mirror and having a predetermined thickness configured to adjust a slope of the laser emission to within a desired range.

54. (Previously Added) The VCSEL structure of claim 53 wherein said thickness of said tuning layer comprises a non-quarter wavelength thickness.

55. (Previously Added) The VCSEL structure of claim 53 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

Cl. contd

56. (Previously Added) The VCSEL structure of claim 54 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

57. (Previously Added) The VCSEL structure of claim 53 wherein said tuning layer is one of a plurality of layers of a distributed Bragg reflector lying between said second mirror and said medium matching layer.

58. (Previously Added) The VCSEL structure of claim 57 wherein said distributed Bragg reflector comprises alternating layers of oxides and nitrides, and said tuning layer comprising a nitride layer of a predetermined non-quarter wavelength thickness.

59. (Currently Amended) An encapsulated VCSEL assembly comprising:

a VCSEL structure comprising a substrate, a first mirror overlying said substrate, an active optical region overlying said first mirror, and a second mirror overlying said active optical region; and

an optically transmissive ~~housing~~ encapsulation medium substantially encapsulating said VCSEL structure wherein said ~~plastic housing~~ encapsulation medium has an index of refraction n1,

said VCSEL structure further comprising an optically transparent, encapsulation medium matching layer deposited onto said VCSEL structure and overlying said second mirror, said medium matching layer having an index of refraction ~~n1~~ n2 substantially equal to ~~an~~ said index of refraction ~~n2~~ n1 of ~~an~~ said encapsulation medium ~~which is to encapsulate said VCSEL structure~~,

said medium matching layer having a predetermined thickness configured to adjust a reflectivity of said second mirror so as to make pre-encapsulation, on-wafer, test characteristics of said VCSEL structure substantially similar to post encapsulation functional characteristics.

C' contd

60. (Previously Added) The VCSEL structure of claim 59 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

61. (Previously Added) The VCSEL structure of claim 59 further comprising an optically transparent tuning layer lying between said second mirror and said medium matching layer, said tuning layer being configured to predictably change a top facet reflectivity of said second mirror and having a predetermined thickness configured to adjust a slope of the laser emission to within a desired range.

62. (Previously Added) The VCSEL structure of claim 61 wherein said thickness of said tuning layer comprises a non-quarter wavelength thickness.

63. (Previously Added) The VCSEL structure of claim 61 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

64. (Previously Added) The VCSEL structure of claim 62 wherein said thickness of said medium matching layer comprises a non-quarter wavelength thickness.

65. (Previously Added) The VCSEL structure of claim 61 wherein said tuning layer is one of a plurality of layers of a distributed Bragg reflector lying between said second mirror and said medium matching layer.

66. (Previously Added) The VCSEL structure of claim 65 wherein said distributed Bragg reflector comprises alternating layers of oxides and nitrides, and said tuning layer comprising a nitride layer of a predetermined non-quarter wavelength thickness.

67. (Currently Amended) A method of fabricating an encapsulated optoelectronic device having controlled characteristics, the method comprising the steps of:

fabricating an optoelectronic device;

measuring a characteristic of said optoelectronic device;

providing an encapsulation medium matching material having an index of refraction n1;

determining a thickness of said encapsulation medium matching material configured to maintain said measured characteristic substantially the same before and after encapsulation;

depositing a layer of said encapsulation medium matching material ~~over~~ onto said optoelectronic device, said layer having said determined thickness;

providing an encapsulating material having an index of refraction n2, which is substantially equal to n1; and

encapsulating said optoelectronic device with said encapsulation material wherein pre-encapsulation, on-wafer, test characteristics of said optoelectronic device are substantially similar to post encapsulation functional characteristics thereof.

C1 cont'd

68. (Previously Added) The method of claim 67 wherein said optoelectronic device comprises a laser, and said step of measuring a characteristic of said optoelectronic device comprising measuring a slope efficiency of said laser.

69. (Previously Added) The method of claim 68 wherein said thickness of said encapsulation medium matching material is determined to maintain the slope efficiency of the laser substantially the same after encapsulation.

70. (Currently amended) A method of fabricating an encapsulated VCSEL having a controlled slope efficiency, the method comprising the steps of:

fabricating a VCSEL structure;

measuring a slope efficiency of said VCSEL structure;

providing an encapsulation medium matching material having an index of refraction n1;

determining in conjunction with one another, a thickness of ~~said~~ a tuning layer ~~material~~ and a thickness of said encapsulation medium matching material configured to maintain said slope efficiency of said VCSEL structure substantially the same before and after encapsulation;

depositing ~~a~~ said tuning layer having said determined thickness;

depositing said encapsulation medium matching material over said VCSEL structure, said medium matching material having said determined thickness;

providing an encapsulating material having an index of refraction n2, which is substantially equal to n1; and

encapsulating said optoelectronic device with said encapsulation material wherein pre-encapsulation, on-wafer, slope efficiency of said VCSEL structure is substantially similar to post encapsulation slope efficiency thereof.

C' cont'd

71. (Currently amended) The method of claim 70 wherein said step of depositing said tuning layer ~~comprising~~ comprises depositing a plurality of layers of a distributed Bragg reflector, said tuning layer being a non-quarter wavelength layer of said Bragg reflector.

72. (Previously Added) The method of claim 71 wherein said distributed Bragg reflector comprises alternating layers of oxides and nitrides, and said tuning layer comprises a nitride layer of a predetermined non-quarter wavelength thickness.